PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Essential fracture and orthopaedic equipment lists in low resource settings: Consensus derived by survey of experts in Africa
AUTHORS	Chan, Yuen; Banza, Leonard; Martin jr., Claude; Harrison, William

VERSION 1 – REVIEW

REVIEWER	Kiran Agarwal-Harding Harvard Combined Orthopaedic Residency Program, Boston, MA, USA, The Orthopaedic and Arthritis Center for Outcomes Research, Brigham and Women's Hospital, Boston, MA, USA
REVIEW RETURNED	30-Apr-2018

GENERAL COMMENTS	Abstract: Line 6: "LMICs lack surgical resources...." A broad generalization. Combine with first sentence. Many LMICs have a growing need for T&O surgical interventions but lack essential surgical resources. Line 12: "each round of questionnaires" Participants and Interventions is repetitive in describing the study design. Line 15: Under Intervention, describe the survey tool, including levels of care assessed. Line 19: questionnaires Line 22: Specialist providers of operative fracture care. Same in line 23. Line 25: Recommendations do not improve care. They guide interventions that improve care. I believe what you are trying to say is adherence to these guidelines has the potential to improve the capacity and quality of T&O care in LMICs. Line 27: "The essential equipment lists...targeted optimally" Without investigating costs and discussing health care expenditure budgets, you can't make this claim. You could say Line 28: Our recommendations can help with planning and organising national T&O care in LMCs to achieve appropriate capacity at all relevant levels of care. Introduction: General comments: You seem to jump back and forth in your argument here. It seems you are trying to say 1) the burden of T&O disease is high in LMICs, 2) many LMICs lack the capacity to treat T&O which can worsen the burden of death and disability, 3) One element of T&O surgical capacity is the essential equipment and supplies to perform surgery, for which no consensus exists for what is essential in the LMIC setting. Such a consensus statement would guide priorities in acquiring essential resources at each level of care, which is especially important when funding is limited. That is how I would structure your intro.

	Page 3, line 18-20: Are you suggesting that the high mortality rates observed by Changomerana et al in Malawi are due to inadequate access to modern orthopaedic care? Does the paper support that claim? Also, LE trauma is devastating because of the untreated disability, which is exacerbated by inadequate access to quality orthopaedic care. The last sentence of this paragraph specifically refers to the economic impact of this burden of disability. Aim: page 3, lines 41-52: Your first sentence and fourth sentence are similar. Combine and remove redundancies. Line 51-52: "Our aim is to produce a generic list..." You provided a generic list, so just say that. "We provide a generic list..." Methods: General comments: Methodology has too much specifics about your tool set up and design. This feels like a copy-paste from the IRB proposal. No need to include the specific text of the survey, or the tasks and expertise of specific authors. Just state how you developed your survey tool, how you administered it, and how you analysed the results. The methods section is also repetitive as it is now - for example, your definitions of essential and desirable are states twice at page 4 lines 21-27, then again on page 5 lines 28-43. It's unclear to me why certain items were added in round 2. Where did these come from? Page 4, line 5: "We used the delphi method..." Used it to do what? To generate a consensus statement of essential resources for T&O surgery at difference levels of care? Line 24-26: "Desirable equipment...." This definition is confusing. I think I follow your definition, but the language needs to be cleaned up. You introduce the "definitely" and "possibly" qualifiers here for the first time. I assume it was how you structured your questionnaire ("Is XX item essential? Definitely, Possibly, or No") but that is not clear. Line 35: You chose to call these "levels of provider" or "tiers of provider". I'm more familiar with the terminology "level of care". All of the definitions listed state they are "centre(s)" (places that provide care) rather than providers (people who provide care). See the WHO Guidelines for Essential Trauma Care. They define all these things there, and you should follow the same format. Line 50-51: Is CMF surgery routinely included in ortho? You've excluded abdominal, thoracic, and head injuries as well. You have focused on management of traumatic injuries to the extremities. Excluding spine is reasonable. You need to be more explicit about what you mean by T&O surgery for the purposes of this paper. Results: General comments: Please write a summary of your results here, rather than just refer to the table. What were the main themes you saw? Discussion: General comments: You mention the WHO GETC for the first time here. It should be mentioned earlier. Did the recommendations guide your survey development? Did the items you listed address procedures they thought should be done at each level of care? If so, then this should be clarified and you should present your results this way. What items were listed as essential, and how does that indicate which procedures your respondents think should be provided at each level of care?

	Your discussion should further detail how your results differ from the recommendations of GETC. What did your experts think was essential that the WHO didn't prioritize? Please read the manuscript closely for grammatical errors.

REVIEWER	Barclay Stewart University of Washington, USA
REVIEW RETURNED	16-May-2018

GENERAL COMMENTS	Great stuff - well condensed equipment list using experts in LMIC ortho care. No need for revision.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Kiran Agarwal-Harding
Institution and Country: Harvard Combined Orthopaedic Residency Program, Boston, MA, USA. The Orthopaedic and Arthritis Centre for Outcomes Research, Brigham and Women's Hospital, Boston, MA, USA
Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below
Abstract:
Line 6: "LMICs lack surgical resources...." A broad generalization. Combine with first sentence. Many LMICs have a growing need for T&O surgical interventions but lack essential surgical resources.

Changed accordingly – 'Low- and middle-income countries (LMICs) have a growing need for trauma and orthopaedic (T&O) surgical interventions but lack surgical resources. We aimed to develop recommendations for an essential list of equipment for three different levels of care providers.'
Line 12: "each round of questionnaires"

Corrected
Participants and Interventions is repetitive in describing the study design.
Line 15: Under Intervention, describe the survey tool, including levels of care assessed.

I have included the type of survey and named the levels of care. I feel in the abstract I cannot go into the details of the levels of care as this would make the abstract too lengthy.
Line 19: questionnaires

Changed
Line 22: Specialist providers of operative fracture care. Same in line 23.

I feel the use of 'with' instead of 'of' is more appropriate in this circumstance.
Line 25: Recommendations do not improve care. They guide interventions that improve care. I believe what you are trying to say is adherence to these guidelines has the potential to improve the capacity and quality of T&O care in LMICs.

Changed – 'These recommendations can facilitate in planning of appropriate equipment required in an institution which in turn has the potential to improve the capacity and quality of T&O care in LMICs.'
Line 27: "The essential equipment lists...targeted optimally" Without investigating costs and discussing health care expenditure budgets, you can't make this claim. You could say

I have changed the sentence – ‘The essential equipment lists provided here can help direct where funding for equipment should be targeted.’ I feel the point of the sentence is that these guidelines help guide which equipment the funding should go towards, but it is not so rigid to say they cannot adapt to their needs accordingly.
Line 28: Our recommendations can help with planning and organising
national T&O care in LMCs to achieve appropriate capacity at all relevant levels of care.
Changed – ‘Our recommendations can help with planning and organising national T&O care in LMICs to achieve appropriate capacity at all relevant levels of care.’

Introduction:
General comments: You seem to jump back and forth in your argument here. It seems you are trying to say 1) the burden of T&O disease is high in LMICs, 2) many LMICs lack the capacity to treat T&O which can worsen the burden of death and disability, 3) One element of T&O surgical capacity is the essential equipment and supplies to perform surgery, for which no consensus exists for what is essential in the LMIC setting. Such a consensus statement would guide priorities in acquiring essential resources at each level of care, which is especially important when funding is limited. That is how I would structure your intro.

I have restructured the introduction according to suggestions.
Page 3, line 18-20: Are you suggesting that the high mortality rates observed by Changomerana et al in Malawi are due to inadequate access to modern orthopaedic care? Does the paper support that claim?

Yes, this was the message from the paper. The paper found mortality higher in the non-operative group. The paper goes on to say ‘severe shortage of staff and operating theatre resources precluded operative fixation for most patients, and those who were offered operative treatment often had to wait for weeks for it’… ‘many injuries that should have been treated with surgery according to modern principles of trauma surgery were treated non-operatively…due to lack of resources’

Also, LE trauma is devastating because of the untreated disability, which is exacerbated by inadequate access to quality orthopaedic care. The last sentence of this paragraph specifically refers to the economic impact of this burden of disability.

I have said earlier in the paragraph, ‘Lower extremity injury can be a devastating event in LMICs due to reduced access to modern orthopaedic care’ which is then followed up with the economic impact to give context.

Aim:
page 3, lines 41-52: Your first sentence and fourth sentence are similar. Combine and remove redundancies.

Changed
Line 51-52: "Our aim is to produce a generic list..." You provided a generic list, so just say that. "We provide a generic list..."
Changed

Methods:
General comments: Methodology has too much specifics about your tool set up and design. This feels like a copy-paste from the IRB proposal. No need to include the specific text of the survey, or the tasks and expertise of specific authors. Just state how you developed your survey tool, how you administered it, and how you analysed the results.

I feel that this is necessary as a good Delphi study allows the reader to be able to reproduce the exact same questionnaire. With questionnaires, the exact wording is important can questions phrased differently can be misleading.

The methods section is also repetitive as it is now - for example, your definitions of essential and desirable are states twice at page 4 lines 21-27, then again on page 5 lines 28-43.

I have taken out the repeated definition on page 5.
It's unclear to me why certain items were added in round 2. Where did these come from?

From suggestions from our expert participant's suggestions after round 1: 'In round 2, we specifically named which additional items were added from the expert suggestions after round 1.'
Page 4, line 5: "We used the Delphi method..." Used it to do what? To generate a consensus statement of essential resources for T&O surgery at difference levels of care?

Amended: We used the Delphi method for this study to generate a consensus statement of essential equipment for T&O care at different levels of care[9 10]. The Delphi method is used to elicit consensus on a given topic.
Line 24-26: "Desirable equipment...." This definition is confusing. I think I follow your definition, but the language needs to be cleaned up. You introduce the "definitely" and "possibly" qualifiers here for the first time. I assume it was how you structured your questionnaire ("Is XX item essential? Definitely, Possibly, or No") but that is not clear.

That is not how the questionnaire was asked. As stated later on 'The responses were graded by the experts on a 5-point Likert scale[12]. The options on the scale were as follows: definitely exclude, possible exclude, neutral, possibly include, definitely include. 'Possibly include' and 'definitely include' were counted towards consensus. Responses 'definitely exclude' and 'possibly exclude' counted towards an item being dropped.'
Line 35: You chose to call these "levels of provider" or "tiers of provider". I'm more familiar with the terminology "level of care". All of the definitions listed state they are "centre(s)" (places that provide care) rather than providers (people who provide care). See the WHO Guidelines for Essential Trauma Care. They define all these things there, and you should follow the same format.

We respect the reviewer's comment but consider that the WHO guidelines are different to the focus of our paper. We did not use it to set up our questionnaire. We used terminology which is familiar to our regional experts in order to maximise comprehension. It would be incorrect to change the terminology used at this stage because that is the wording we used in our questionnaire and as part of the Delphi method, the wording should stay the same so that it can be reproducible. This is a quality indicator of the Delphi study.
Line 50-51: Is CMF surgery routinely included in ortho? You've excluded abdominal, thoracic, and head injuries as well. You have focused on management of traumatic injuries to the extremities. Excluding spine is reasonable. You need to be more explicit about what you mean by T&O surgery for the purposes of this paper.

CMF is not routine in orthopaedics. We mention it because it covers fractures – but relating to the cranio-facial area.

Trauma of 'trauma and orthopaedics' refer to orthopaedic trauma, which is a well-recognised term as it is a sub-speciality in its own right in the UK. We do not deal with abdominal, thoracic or head injuries which is managed by their own sub specialities. This paper was not intended to deal with abdominal, thoracic, and head injuries as well.

Results:

General comments: Please write a summary of your results here, rather than just refer to the table. What were the main themes you saw?
Summary paragraph added: 'For the non-operative provider, the essential equipment related to things that are required for non-operative treatment such as traction and plaster casts. Essential equipment for the specialist provider included equipment for operative intervention, such as the small fragment set, large fragment set, SIGN/rush nailing, external fixators, K wiring set as well as large cannulated screws. It did not include the full complement of surgical kit offered for selection as these centres are less likely to be performing the full complement of surgical interventions. The majority of equipment for selection was recommended as essential for a tertiary provider with the remaining 3 equipment being listed as desirable. The essential equipment for tertiary provider included total hip and knee sets as well as reduction clamps for pelvic operations as these centres would potentially be able to offer these types of operations.'

Discussion:
General comments: You mention the WHO GETC for the first time here. It should be mentioned earlier.

I have briefly mentioned it in the introduction however, the WHO GETC is mentioned in the discussion as it aids the point we are trying to make. They specifically mention the operations required but does not give a list of specific T&O equipment. It is this gap we are trying to address. They have specifically said in their guidance 'no attempt has been made to list the hardware required for fixation of fractures, but it is expected that a country will be able to standardize its own requirements (implants and equipment sets) with local professional expertise'. We are providing the local expertise (LMICs in sub Saharan Africa) as recognised by WHO but this is independent of the WHO guidelines and for a specific demographic. Therefore, we are creating a list of equipment that does not already exist in the literature.

Did the recommendations guide your survey development? The WHO guidelines did not guide our survey development. We designed our survey using experts who have many years of combined experience in working in LMICs, our targeted demographic.

Did the items you listed address procedures they thought should be done at each level of care? If so, then this should be clarified, and you should present your results this way. What items were listed as essential, and how does that indicate which procedures your respondents think should be provided at each level of care? This has been added to the discussion. I don't think the results sections should be changed to relate the items to the procedures listed as the listed procedures are very broad (for example internal fixation – most of the equipment would cover this point listed by WHO) and we have a list of very specific equipment dependent on the situation.
Your discussion should further detail how your results differ from the recommendations of GETC. What did your experts think was essential that the WHO didn't prioritize?

I have expanded my discussion to address some of your points.

Please read the manuscript closely for grammatical errors.

Thank for your comments. Both me and the senior author have done this.

Reviewer: 2
Reviewer Name: Barclay Stewart
Institution and Country: University of Washington, USA
Please state any competing interests or state 'None declared': None

Please leave your comments for the authors below
Great stuff - well condensed equipment list using experts in LMIC ortho care. No need for revision.

We appreciate this affirming review and its recommendation that our manuscript should be published without further editing.

We have made changes as requested by the first reviewer, and many of our responses are explanations rather than changes so as to respect also the second reviewer.

VERSION 2 – REVIEW

REVIEWER	Kiran Agarwal-Harding Harvard Combined Orthopaedic Residency Program, Boston, MA, USA. The Orthopaedic and Arthritis Centre for Outcomes Research, Brigham and Women's Hospital, Boston, MA, USA.
REVIEW RETURNED	27-Jul-2018

GENERAL COMMENTS	Thank you for addressing many of my points. Lovely paper; looking forward to seeing it in print.